

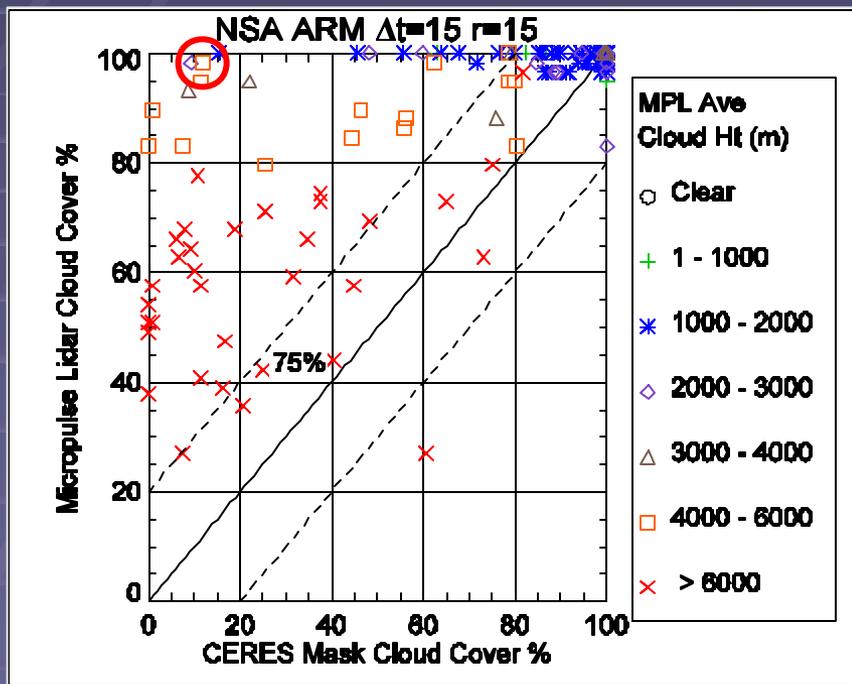
Comparison of CERES and
MODIS Team Daytime Cloud
Cover Estimates using
Surface Instruments at the NSA
ARM site: 2001 Data

T. A. Berendes, D. A. Berendes,
R. M. Welch, T. Uttal, E.
Clothiaux, and E. Dutton

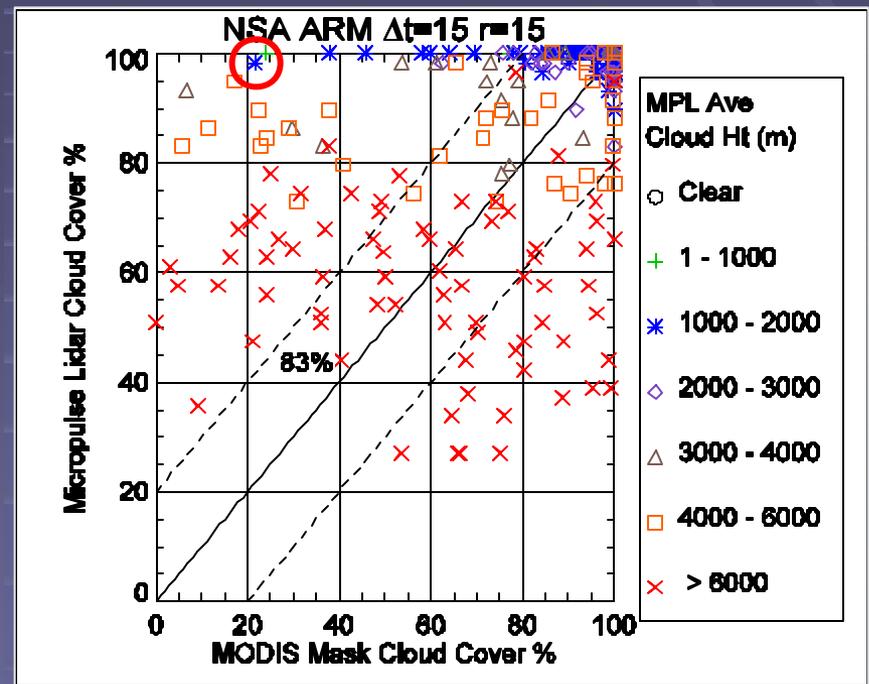
Data

- Feb – Sept 2001
- ARM NSA at Barrow
- 850 CERES matches
- 3650 MODIS matches

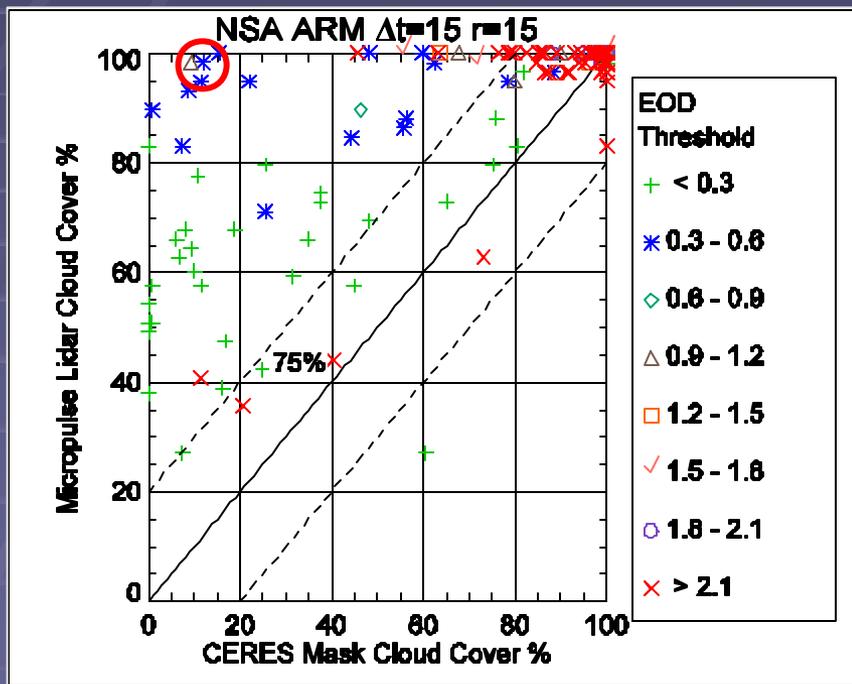
CERES Mask



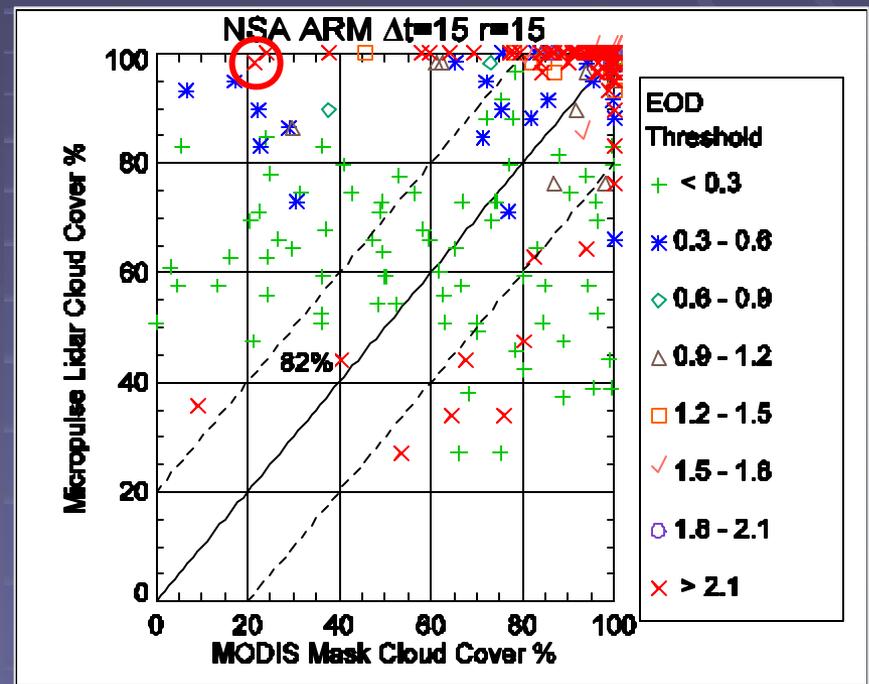
MODIS Mask

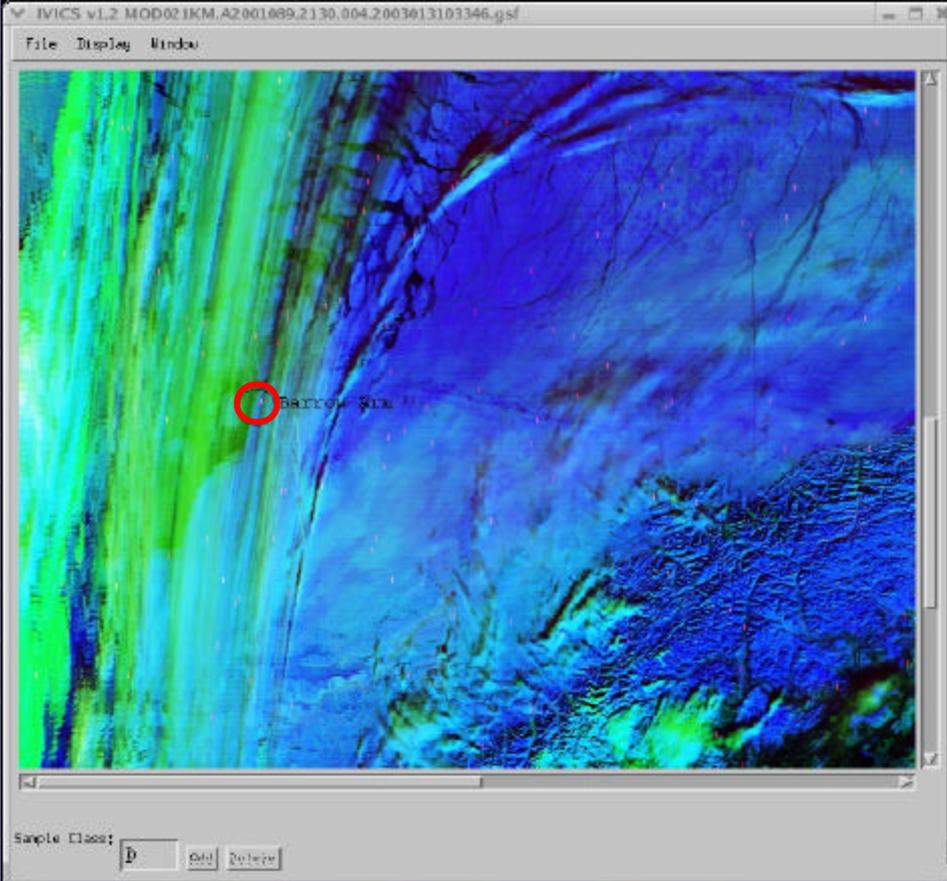


CERES Mask



MODIS Mask





IVICS Pixel Info

```

20 [9.75000] 230.9590
31 [11.05000] 245.4225
32 [12.02000] 245.2257
33 [13.34000] 238.2238
34 [13.64000] 232.6116
35 [13.94000] 229.0536
36 [14.24000] 219.7574
EV Base25 [1.37500] 0.0284

```

CERES	15
MODIS	--
UAH	81
VCEIL	96
MPL	100
ARSL	100
MMCR	100
WSI	--
EOD	0.6

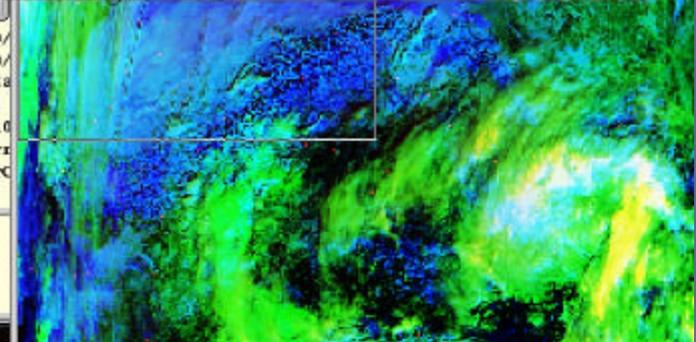
```

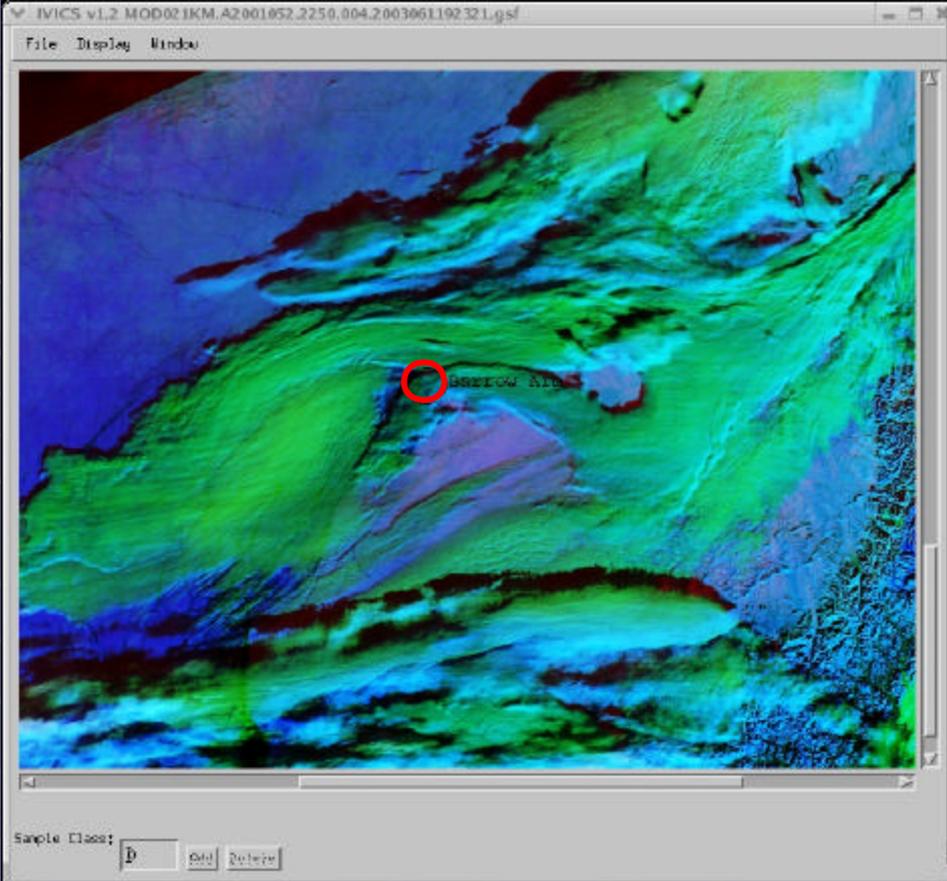
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0006.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0811.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2133.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2311.cdf

```

at, Apr 26 4:04pm - /t1/data/validation/proposal/ivics_shots

todd@pixel [60] gimp





IVICS Pixel Info

```

26 [13.9400,] 234.1520
26 [14.2400,] 225.4131
EV_Band25 [1.3750,] 0.0000
ch29 - ch31 -0.8085
ch20 - ch31 5.3921
ch20 - ch22 4.6890
NDVI (ch1 - ch6) / (ch1 + ch6) 0.5832
NDVI (ch2 - ch1) / (ch2 + ch1) 0.0413

```

CERES	63
MODIS	23
UAH	39
VCEIL	100
MPL	100
ARSCL	100
MMCR	100
WSI	--
EOD	10.0

The GIMP

```

-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0006.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0811.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2133.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2311.cdf

```

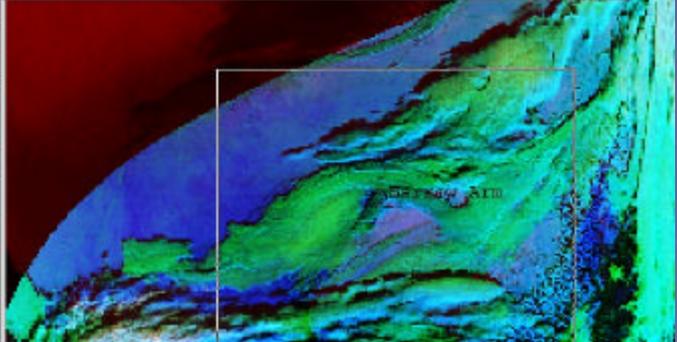
```

Remove rm -f /t1/data/v
Remove rm -f /t1/data/v
Remove rm -rf /t1/data/
line 1986 start time: 2
image moved to line 139
clicked on site 0 Barro
in FindSiteClassifierC

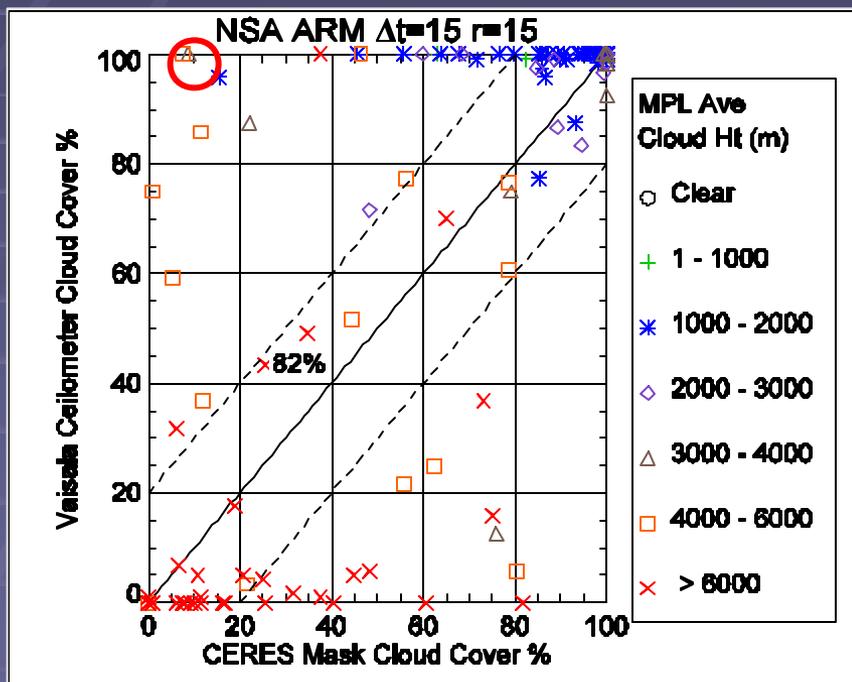
```

at, Apr 26 4:04pm - /t1/data/validation/proposal/ivics_shots

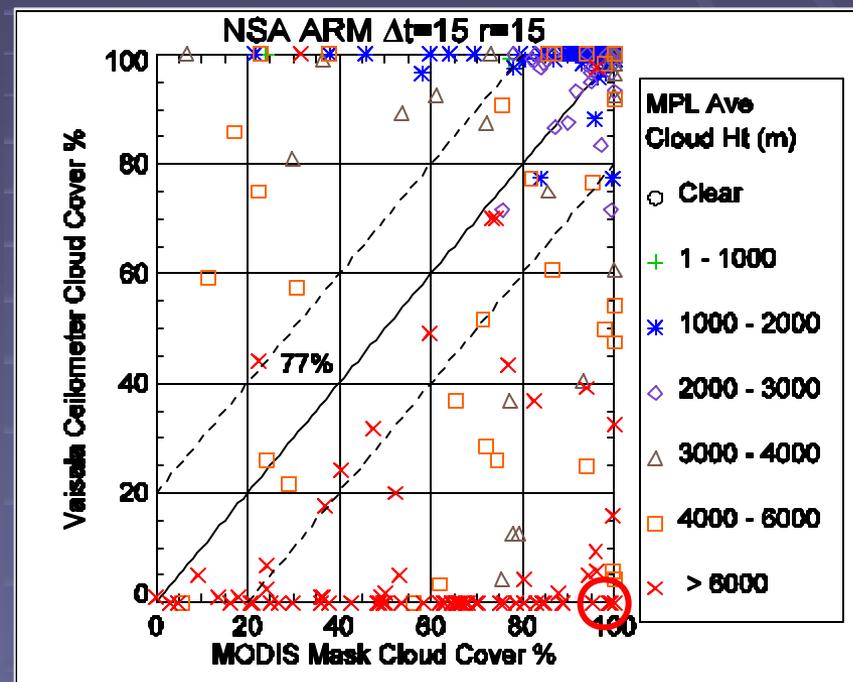
todd@pixel [60] gimp



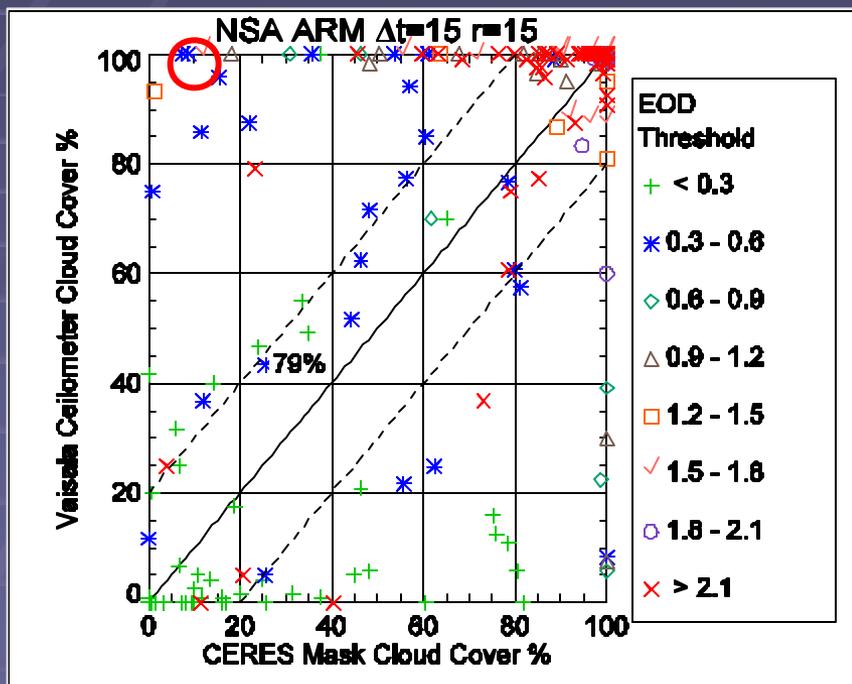
CERES Mask



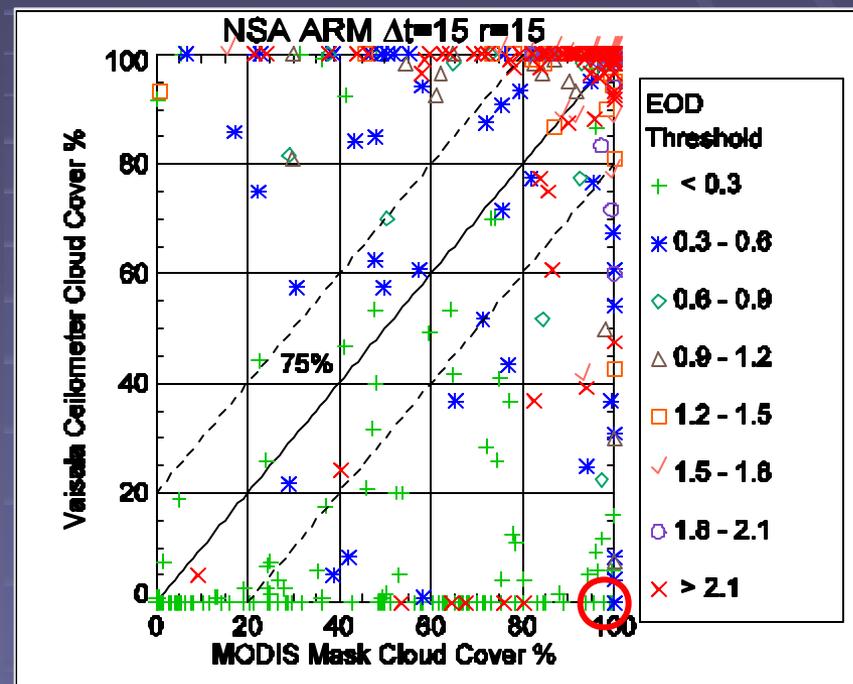
MODIS Mask

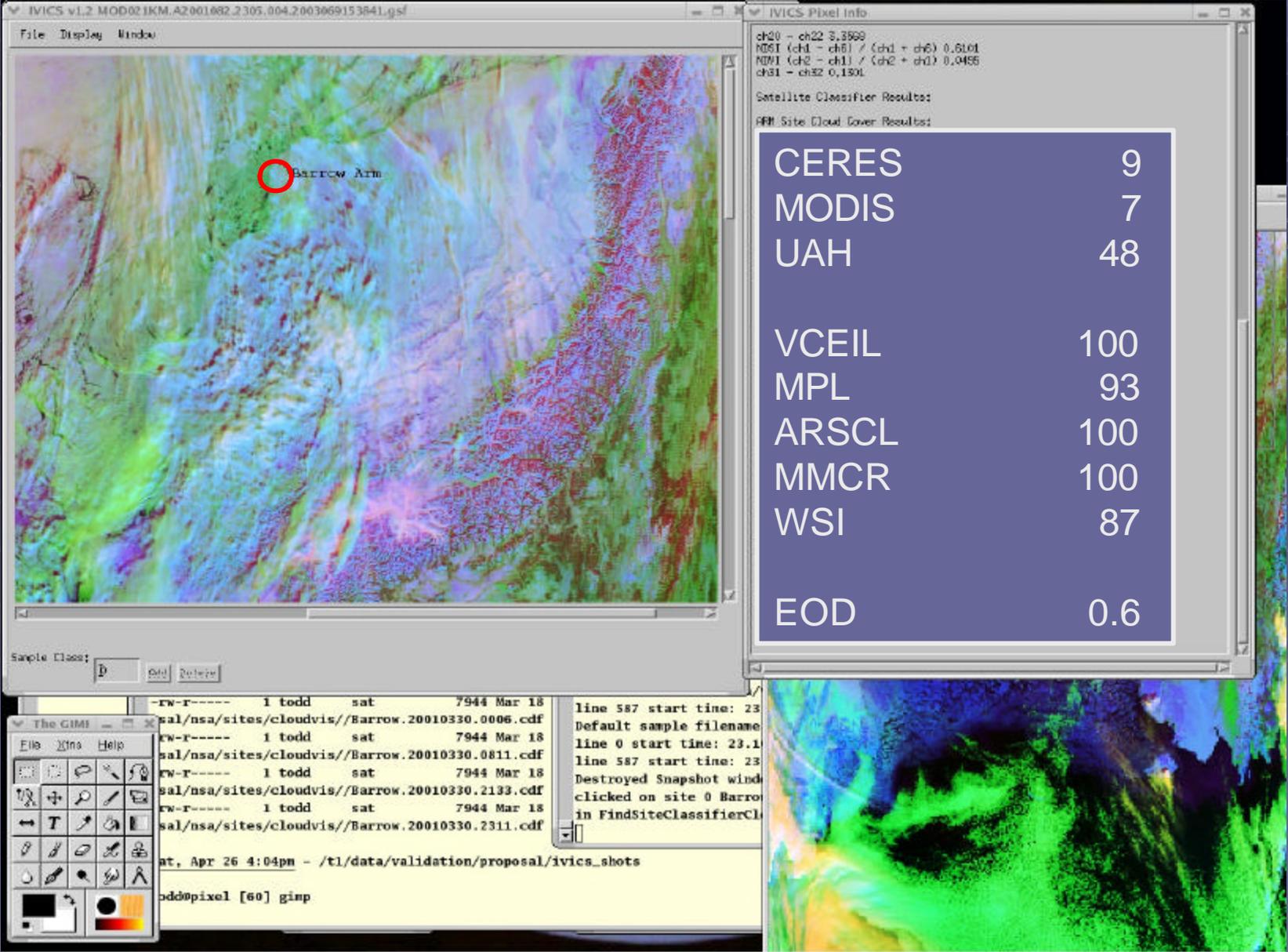


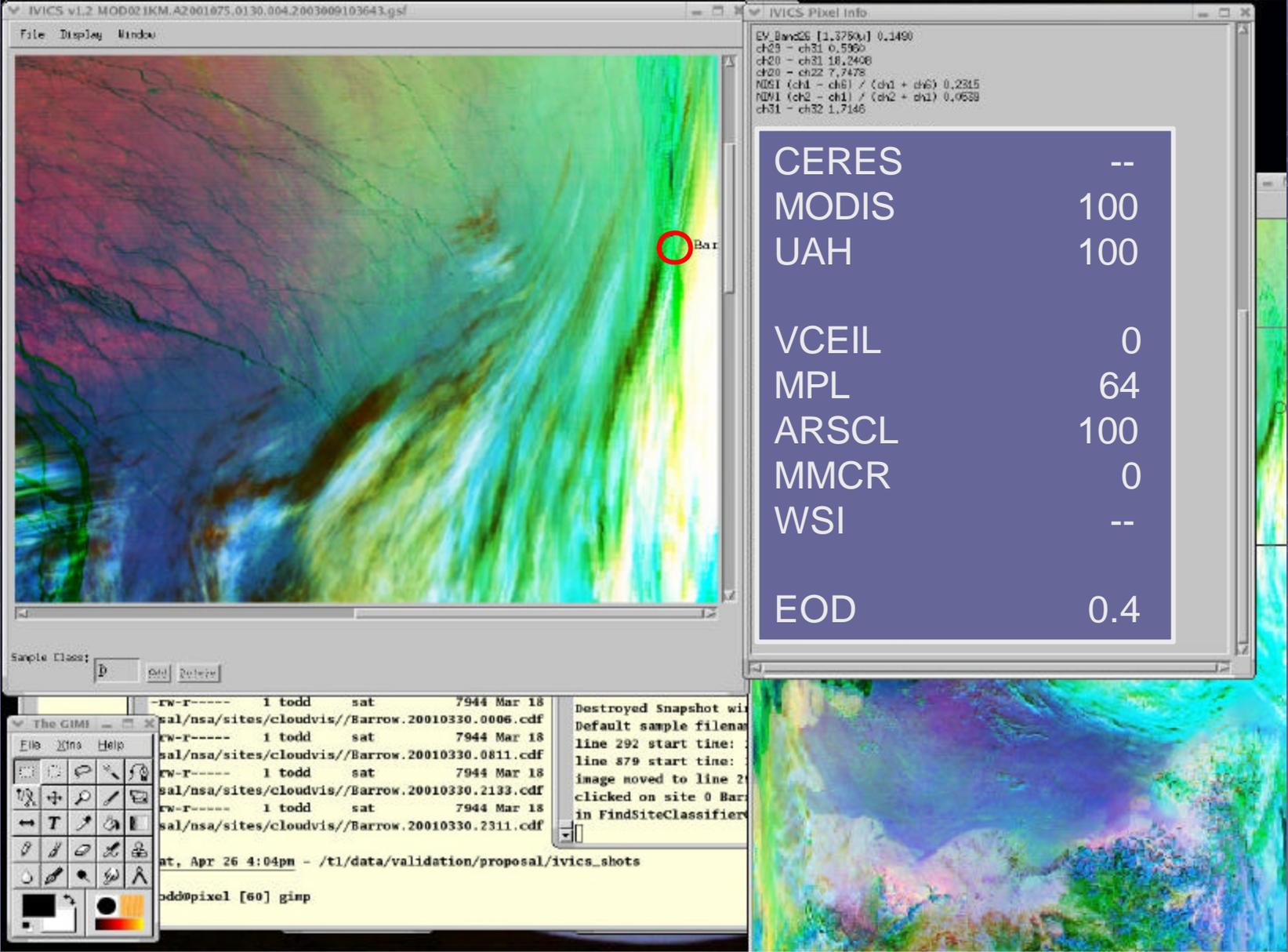
CERES Mask



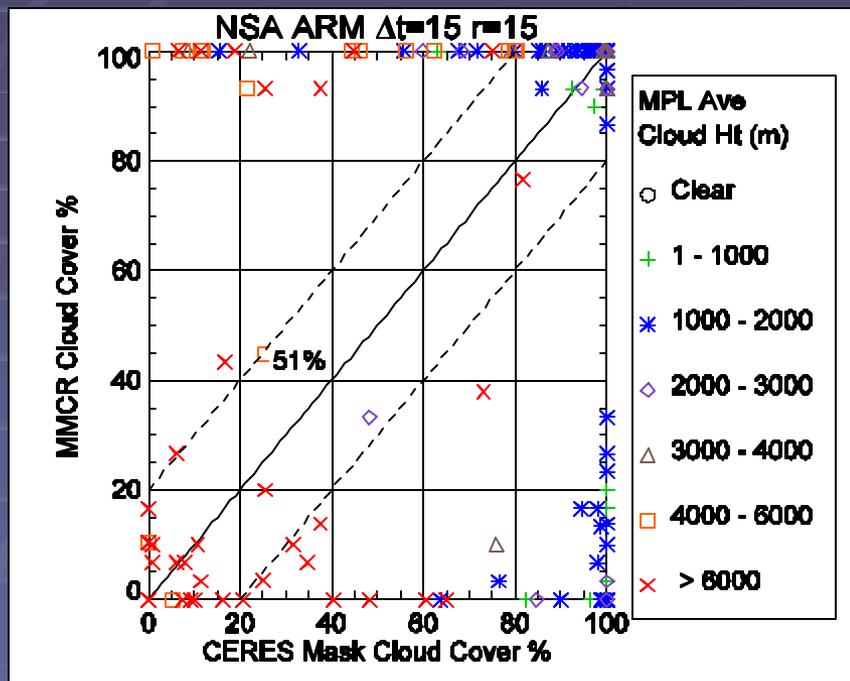
MODIS Mask



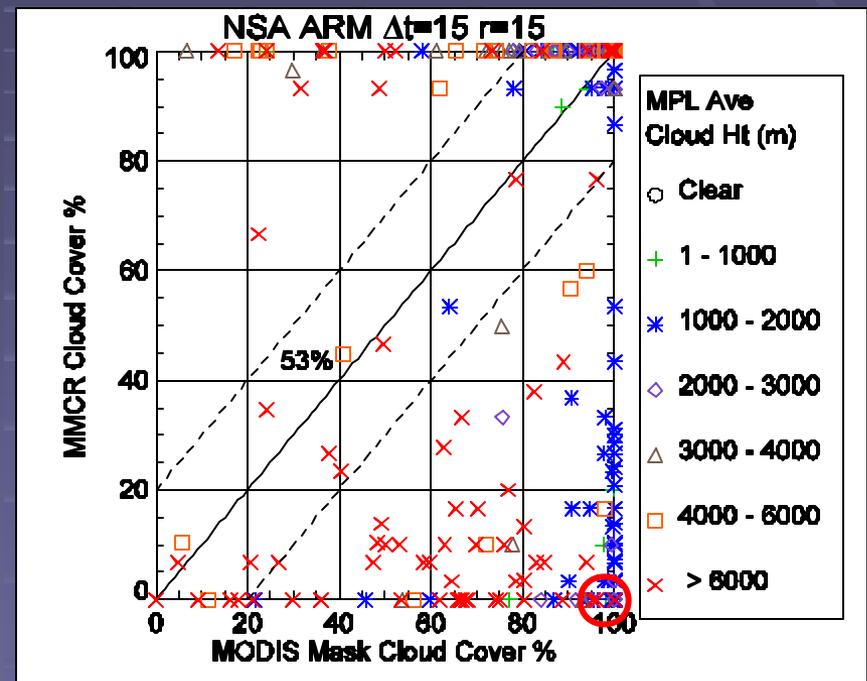




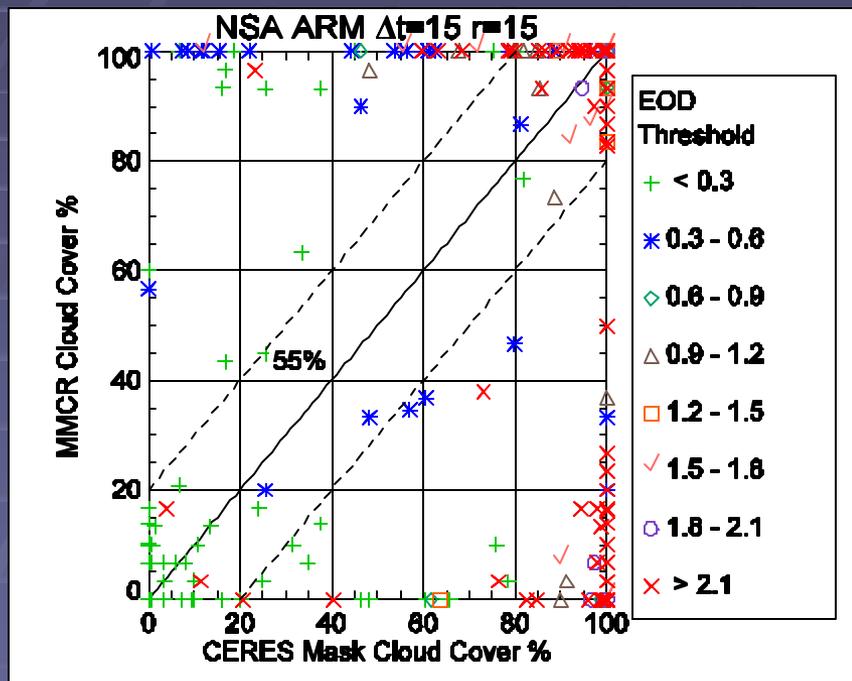
CERES Mask



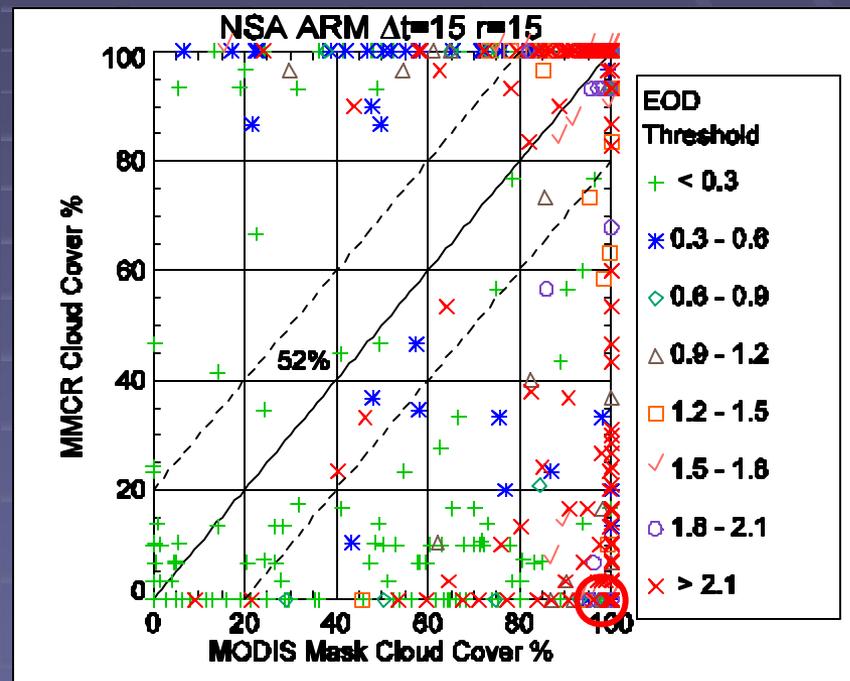
MODIS Mask

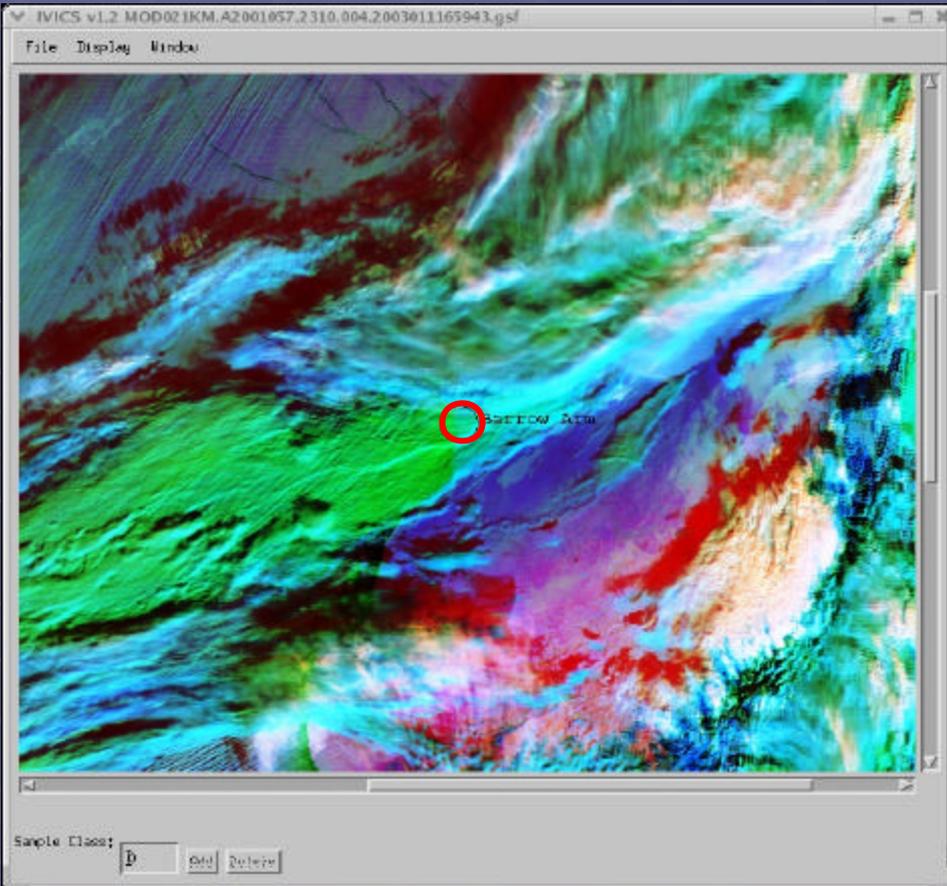


CERES Mask



MODIS Mask





IVICS Pixel Info

```

26 [13.9400,] 235.4017
36 [14.2400,] 226.6806
EV_Band25 [1.3750,] 0.0157
ch29 - ch31 -0.9881
ch20 - ch31 9.7006
ch20 - ch22 6.3894
NDVI (ch1 - ch5) / (ch4 + ch5) 0.2241
NDVI (ch2 - ch1) / (ch2 + ch1) 0.0792
  
```

CERES	100
MODIS	100
UAH	100
VCEIL	100
MPL	100
ARSCl	100
MMCR	0
WSI	79
EOD	1.6

The GIMP

File Xtns Help

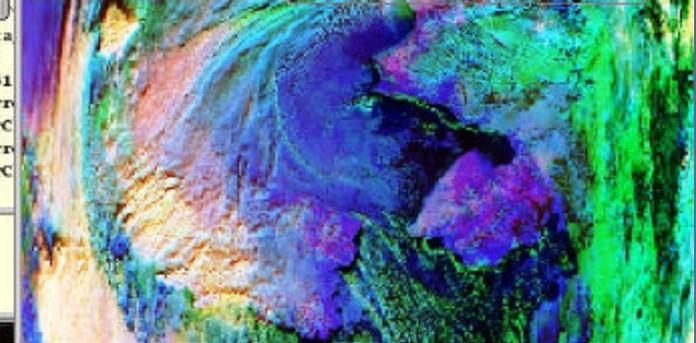
at, Apr 26 4:04pm - /t1/data/validation/proposal/ivics_shots

odd@pixel [60] gimp

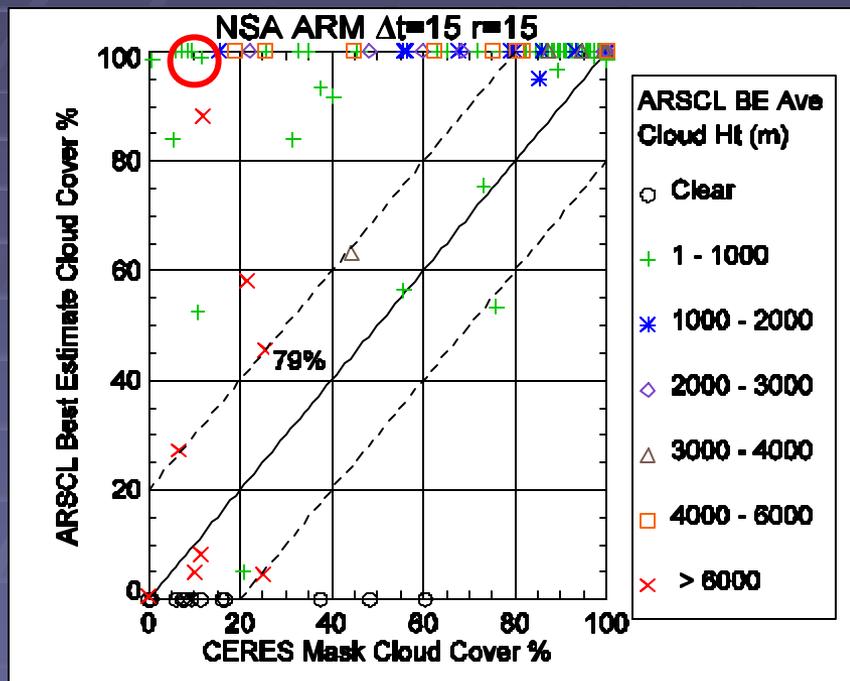
```

-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0006.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.0811.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2133.cdf
-rw-r----- 1 todd  sat  7944 Mar 18
sal/nsa/sites/cloudvis//Barrow.20010330.2311.cdf
  
```

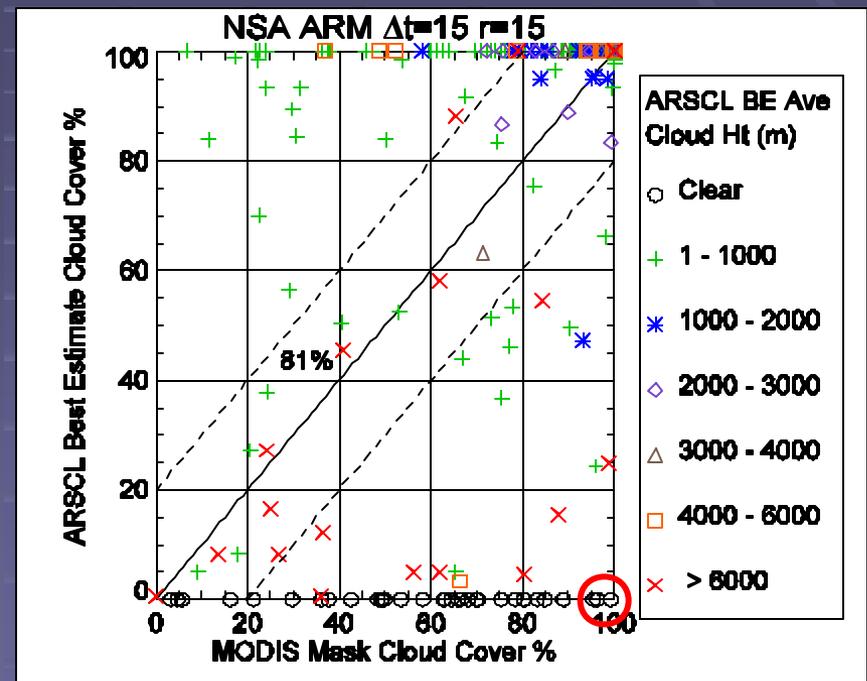
Remove rm -rf /t1/data
line 1199 start time:
image moved to line 61
clicked on site 0 Barr
in FindSiteClassifierC
clicked on site 0 Barr
in FindSiteClassifierC



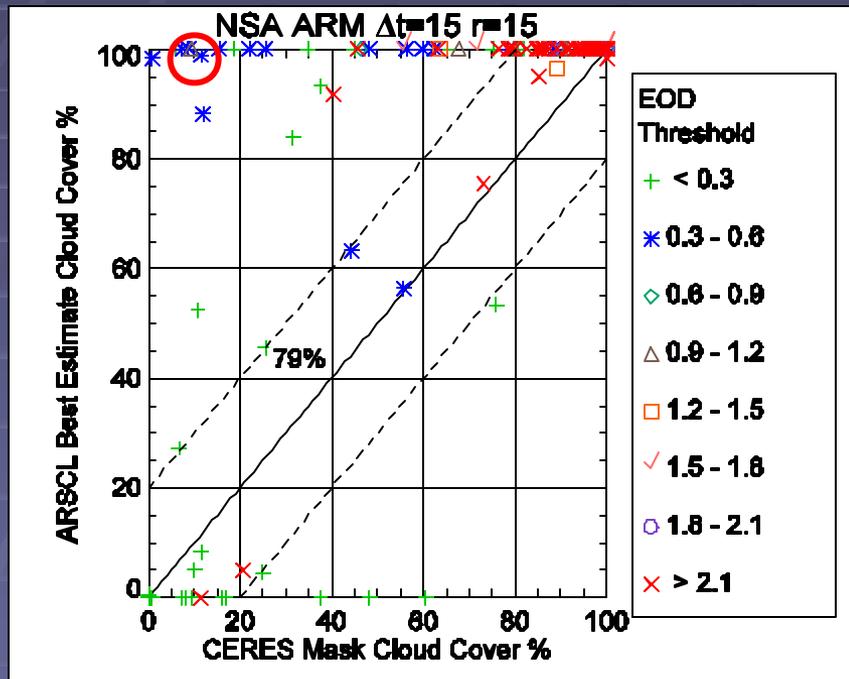
CERES Mask



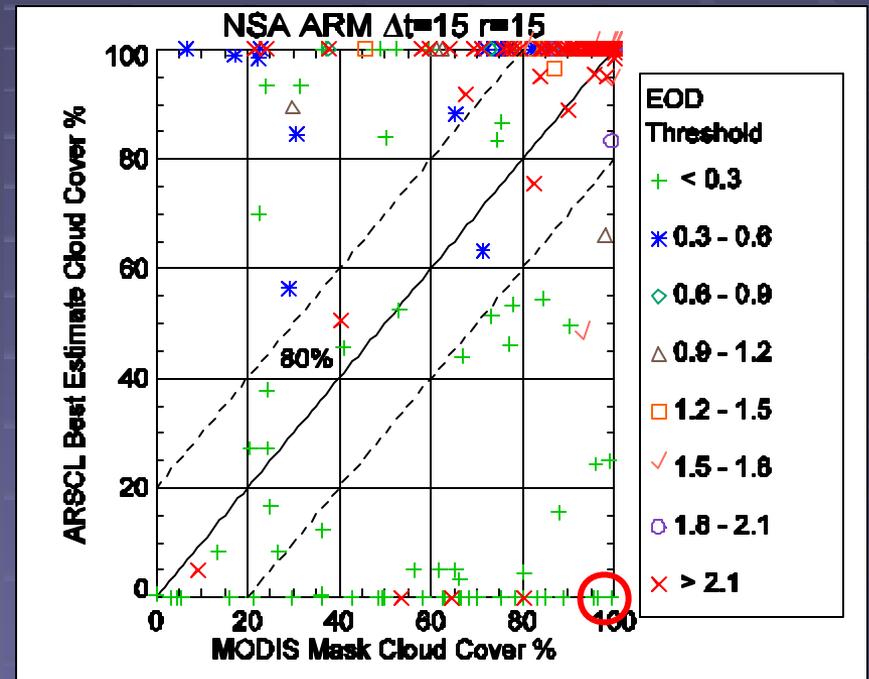
MODIS Mask

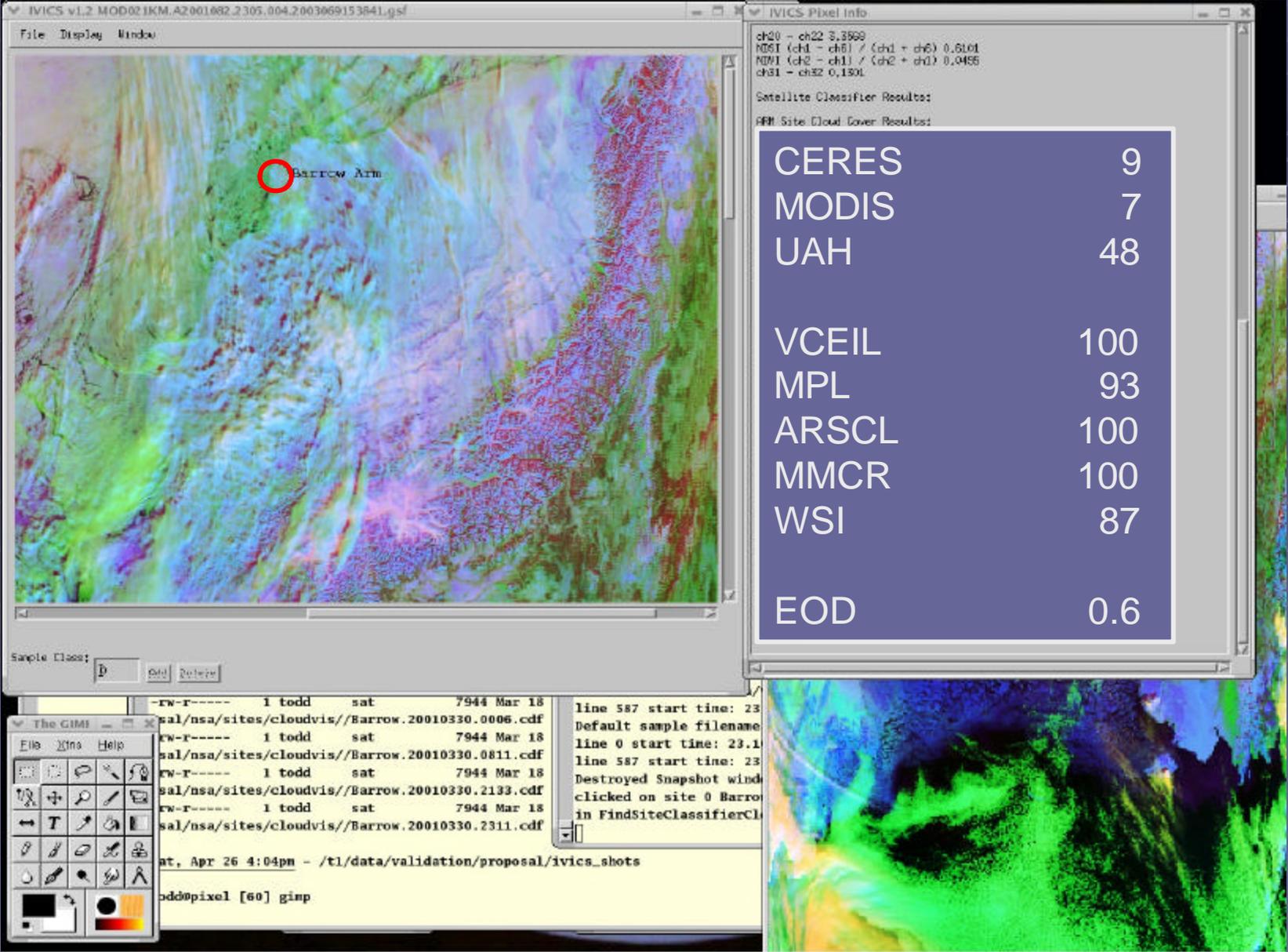


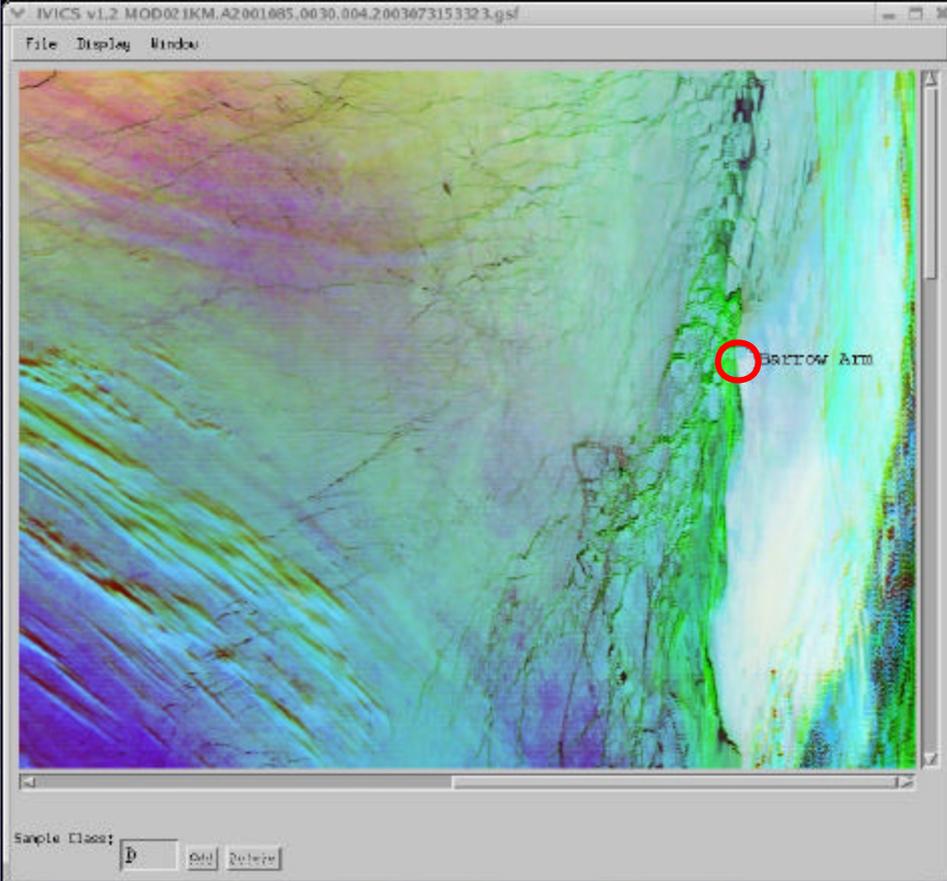
CERES Mask



MODIS Mask







IVICS Pixel Info

```

26 [14.2000,] 219.4819
EV_Band26 [1.3750,] 0.0275
ch29 - ch31 0.7633
ch20 - ch31 10.8847
ch20 - ch22 6.6593
NDGI (ch1 - ch6) / (ch1 + ch6) 0.9066
NDVI (ch2 - ch1) / (ch2 + ch1) 0.0712
ch31 - ch32 0.3608

```

CERES	48
MODIS	96
UAH	96
VCEIL	6
MPL	69
ARSCl	0
MMCR	--
WSI	2
EOD	0.1

The GIMP interface is visible, showing a toolbar and a terminal window. The terminal displays the following text:

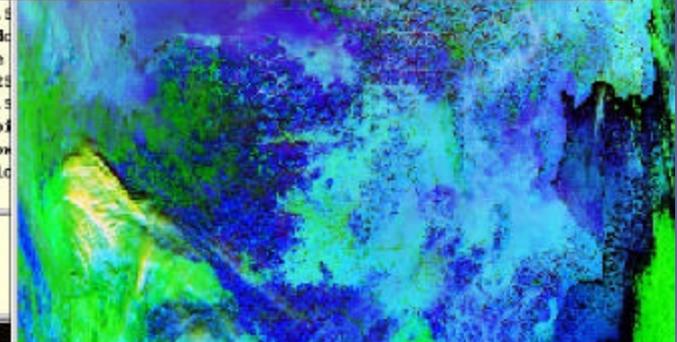
```

-rw-r----- 1 todd  sat  7944 Mar 18  20010330.0006.cdf
sal/nsa/sites/cloudvis/Barrow.20010330.0006.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  20010330.0811.cdf
sal/nsa/sites/cloudvis/Barrow.20010330.0811.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  20010330.2133.cdf
sal/nsa/sites/cloudvis/Barrow.20010330.2133.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  20010330.2311.cdf
sal/nsa/sites/cloudvis/Barrow.20010330.2311.cdf

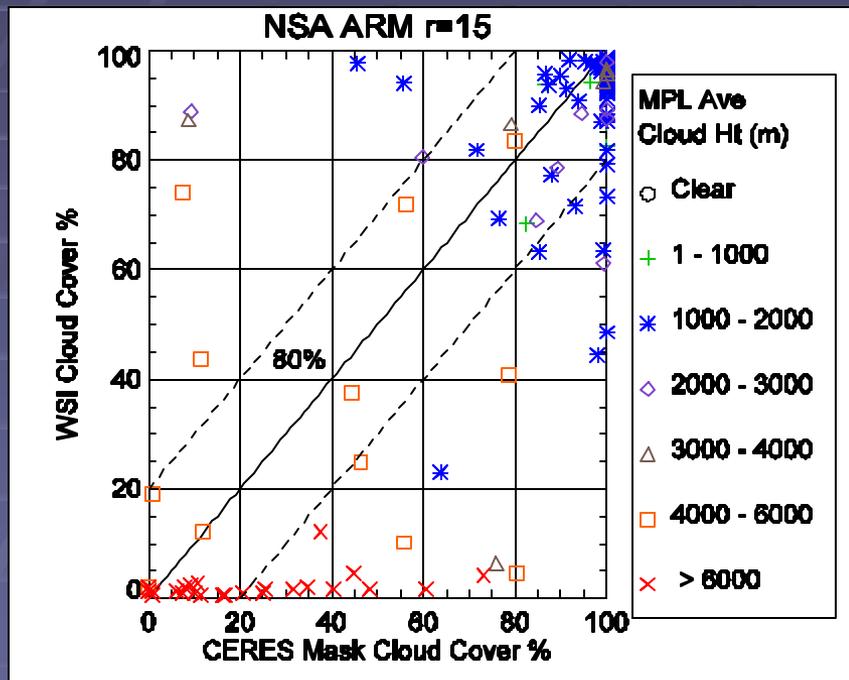
```

at, Apr 26 4:04pm - /t1/data/validation/proposal/ivics_shots

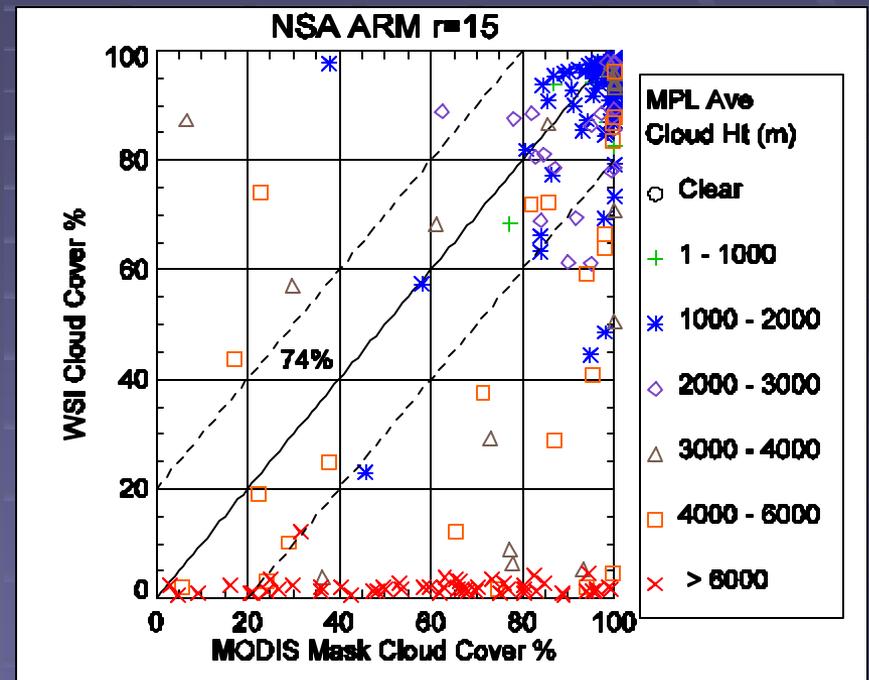
todd@pixel [60] gimp



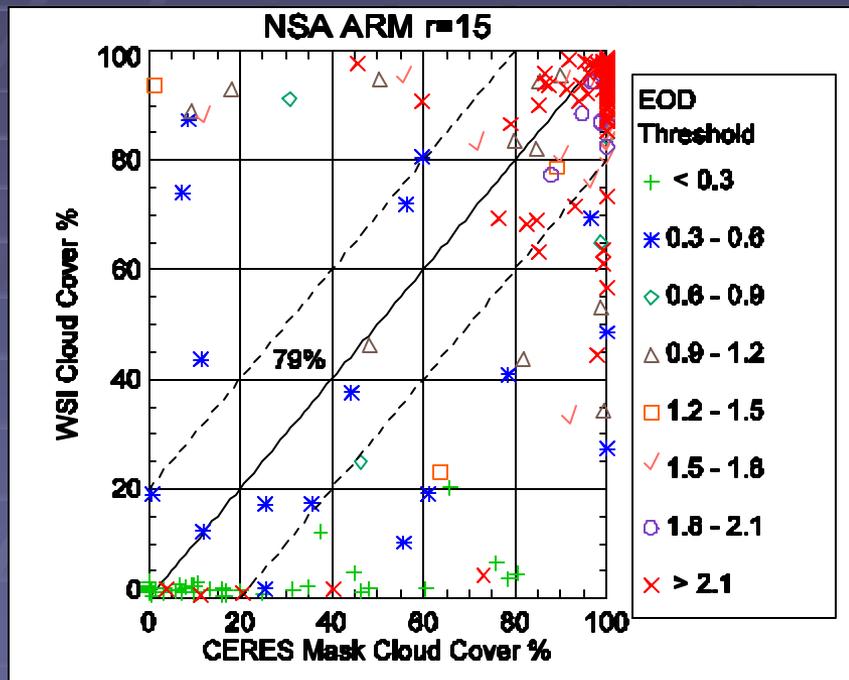
CERES Mask



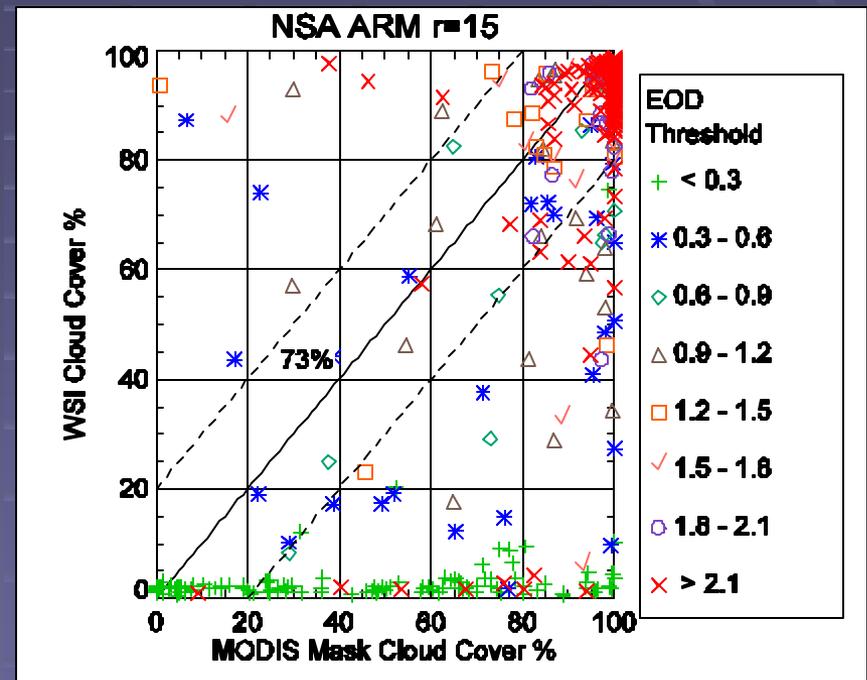
MODIS Mask



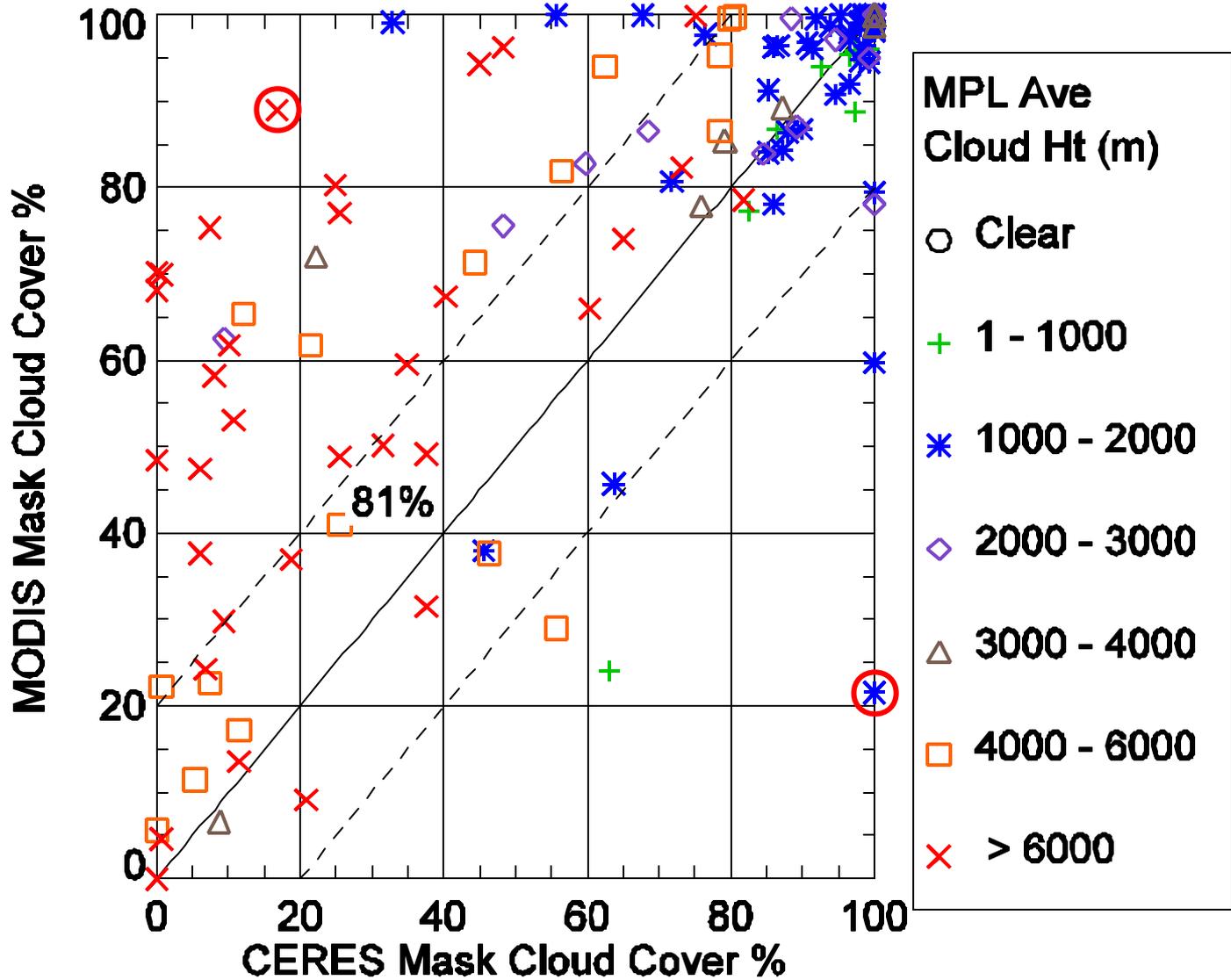
CERES Mask



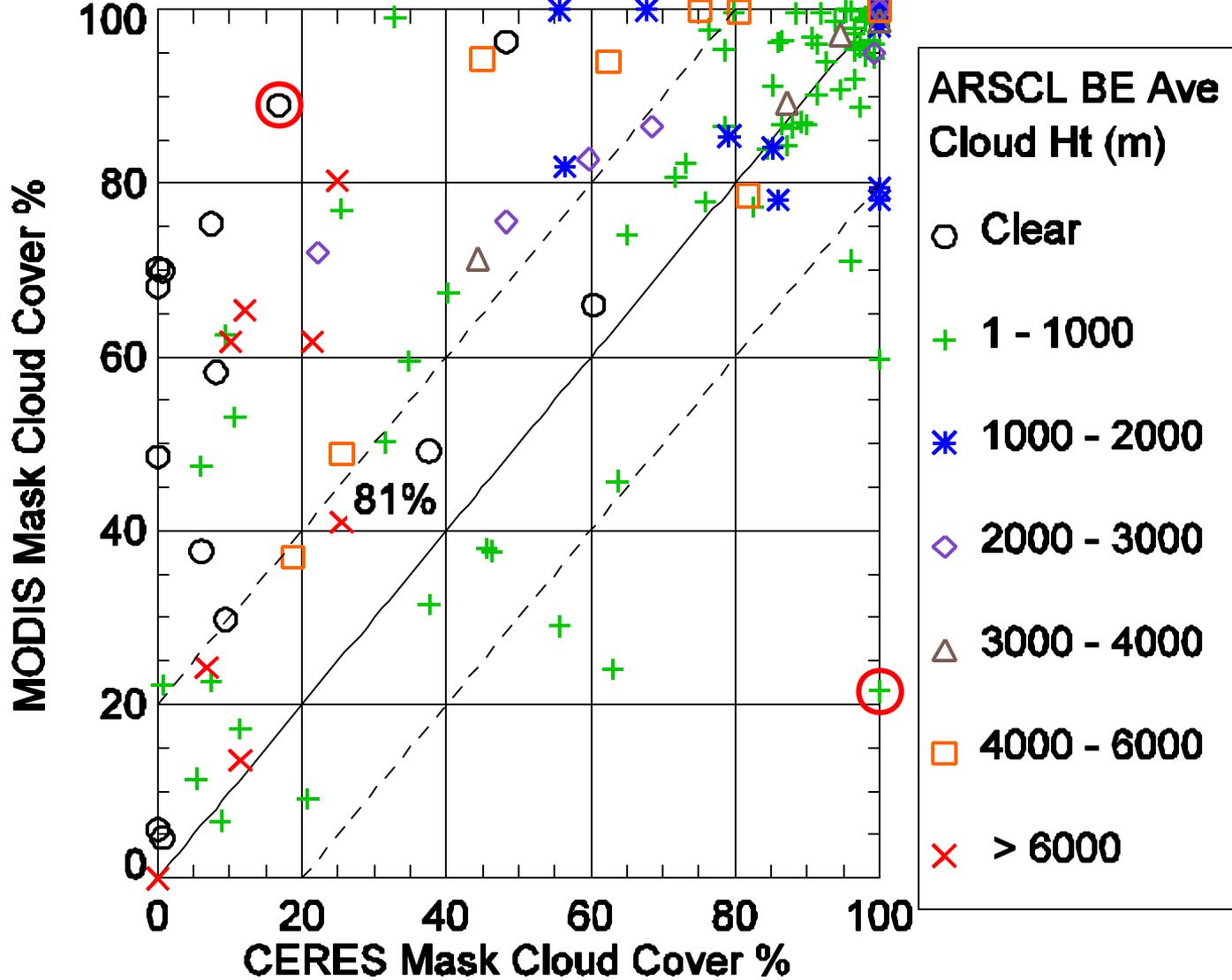
MODIS Mask



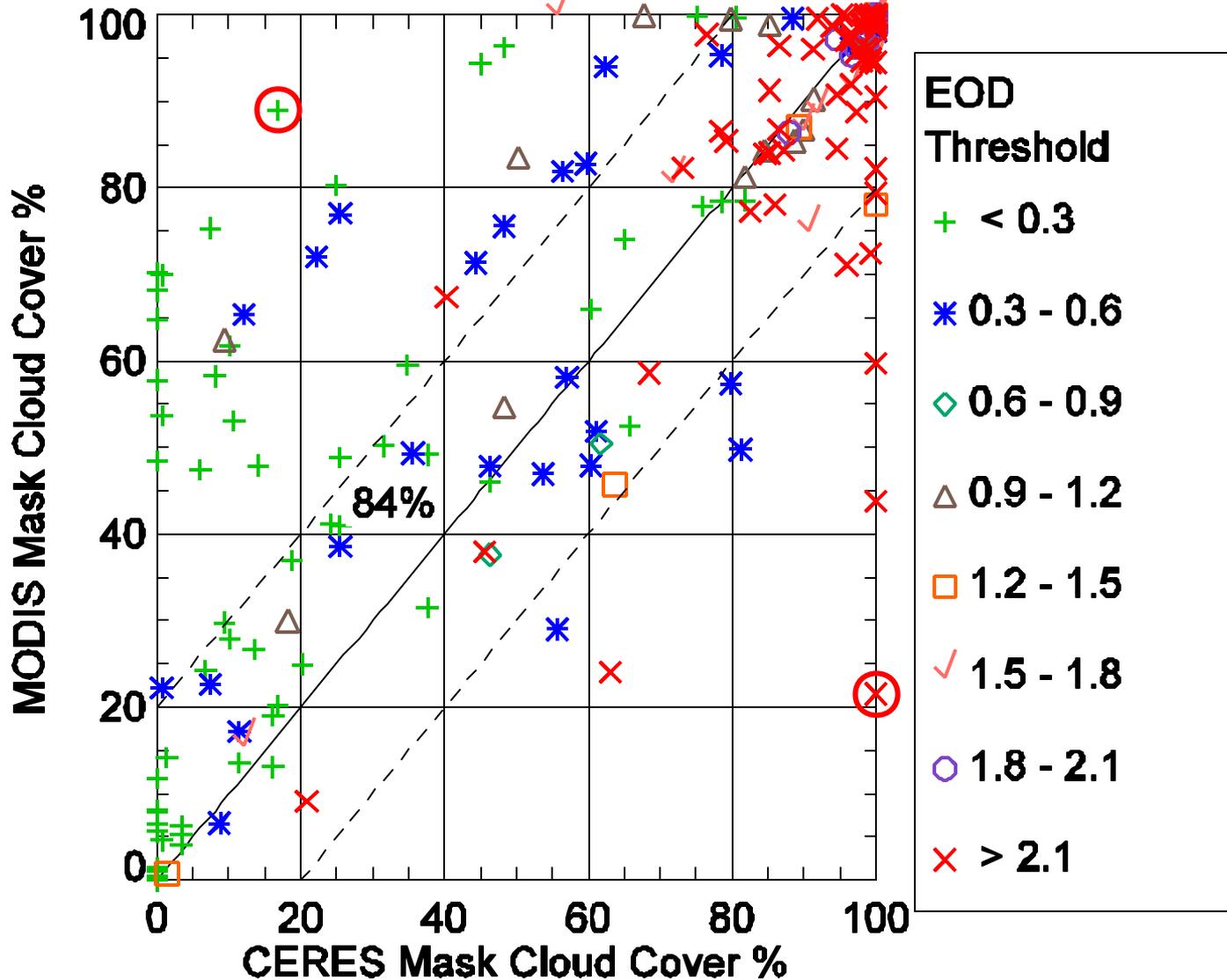
NSA ARM $\Delta t=15$ $r=15$

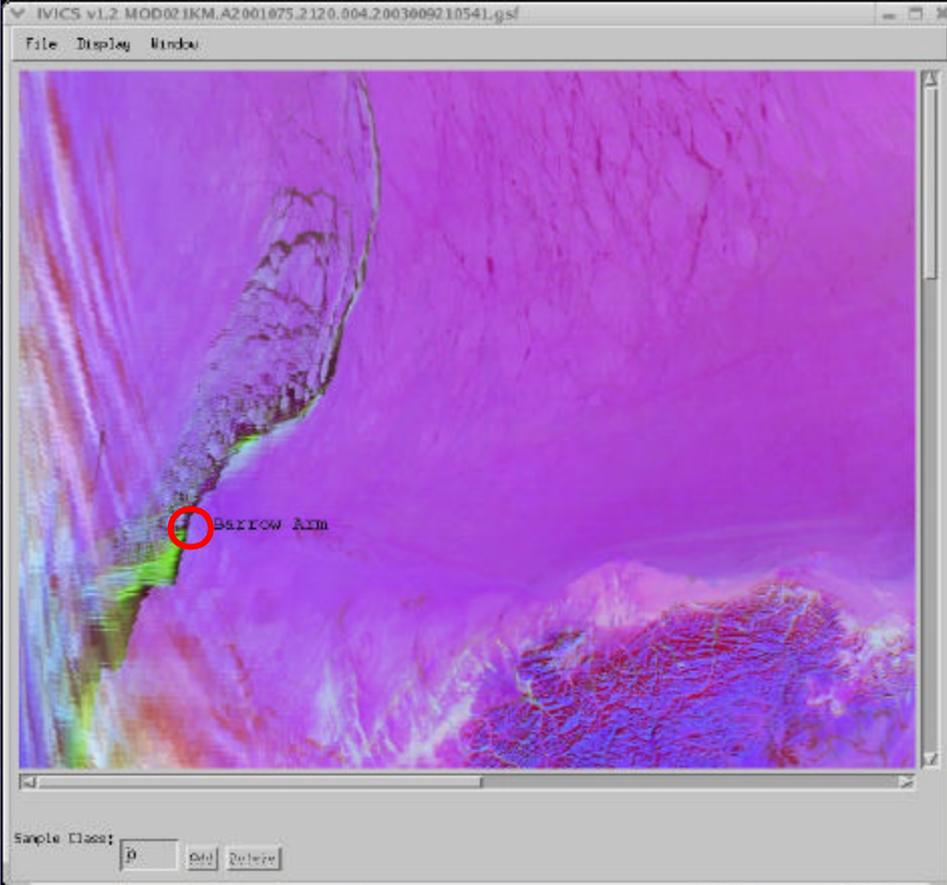


NSA ARM $\Delta t=15$ $r=15$



NSA ARM $\Delta t=15$ $r=15$





IVICS Pixel Info

Satellite Classifier Results:

CERES	16
MODIS	89
UAH	41
VCEIL	0
MPL	44
ARSCL	0
MMCR	40
WSI	1
EOD	0.1

Cloud Cover Results:

```

41.04
16.78
89.00

```

```

Remove rm -f /t1/data/validation/tmp//site_file
Remove rm -f /t1/data/validation/tmp//site_validate.txt
Remove rm -rf /t1/data/validation/tmp//validate
line 601 start time: 21.359603
Red bits 8 Green bits 8 Blue bits 8
clicked on site 0 Barrow Arm
in FindSiteClassifierCloudCover

```

```

Sat, Apr 26 3:50pm - /t1/gsf/
toddd@pixel [82]
Sat, Apr 26 3:49
toddd@pixel [58]
[1] 5462
Sat, Apr 26 3:51
toddd@pixel [59]

```



```

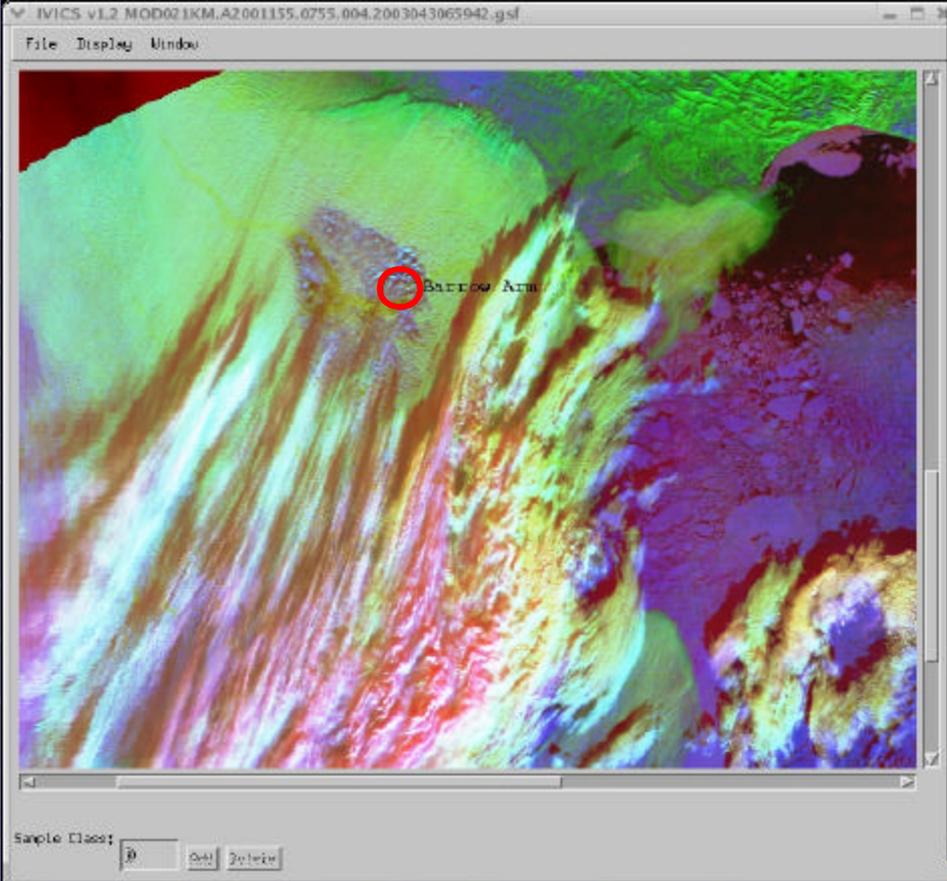
tion/proposal/
tion/proposal/ivics_shots

```

```

gsf/validation/src/id1

```



IVICS Pixel Info

```

ch20 - ch21 -1.2930
ch20 - ch21 2.2920
ch20 - ch22 1.5858
NDSI (ch1 - ch6) / (ch1 + ch6) 0.4251
NDVI (ch2 - ch1) / (ch2 + ch1) 0.0252
ch21 - ch22 0.0069

```

Satellite Classifier Results:

CERES	100
MODIS	22
UAH	59
VCEIL	100
MPL	96
ARSL	100
MMCR	0
WSI	--
EOD	10.0

Sample Class:

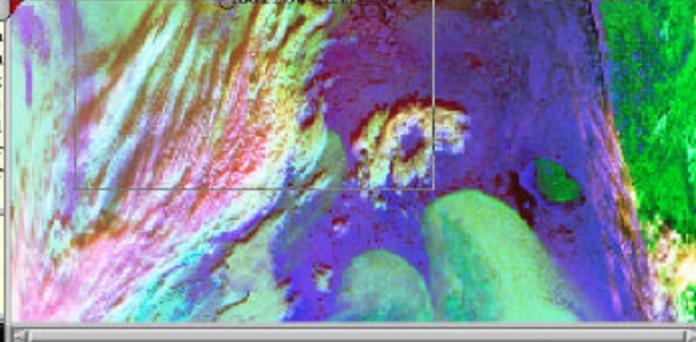
```

-rw-r----- 1 todd  sat  7944 Mar 18  /sal/nsa/sites/cloudvis/Barrow.20010330.0006.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  /sal/nsa/sites/cloudvis/Barrow.20010330.0811.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  /sal/nsa/sites/cloudvis/Barrow.20010330.2133.cdf
-rw-r----- 1 todd  sat  7944 Mar 18  /sal/nsa/sites/cloudvis/Barrow.20010330.2311.cdf

```

at, Apr 26 4:04pm - /t1/data/validation/proposal/ivics_shots

todd@pixel [60] gimp



Conclusions

- MODIS finds more high, thin clouds than CERES – more sensitive
- MODIS finds clouds when ARSCL clear – may find too much cloud
- MMCR instrument problems
- Sensitivity of each mask to thin clouds needs to be determined
- Use-based sensitivity for validation of masks

Future Work

- New MMCR analysis
 - Avoid instrument failures
 - Categorize cloud types for comparison
- NIP within-minute variance to detect thin (sub-visible) cloud